

WAVES - Boundary Behaviour

Period

- shortest time interval during which motion repeats itself
- $T = 1/f$ (unit is seconds)

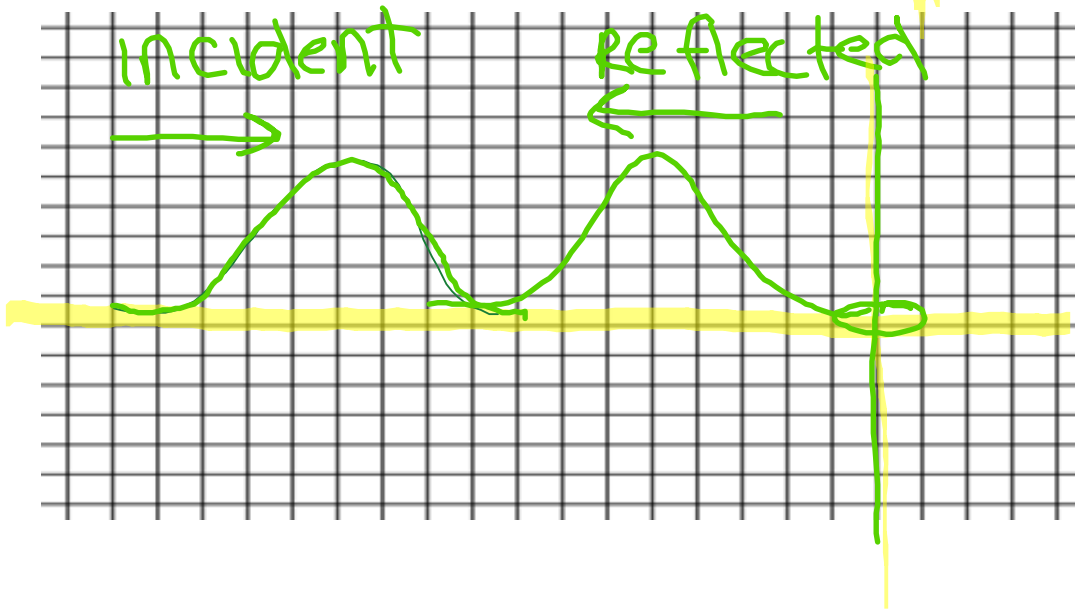
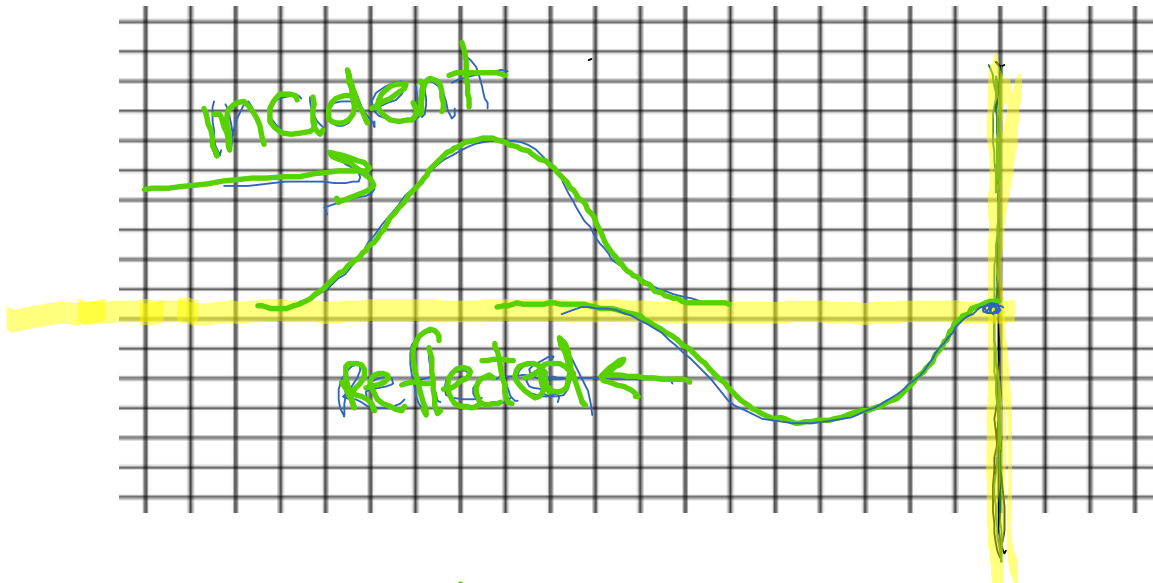
Frequency

- number of complete cycles (crests/troughs) per second measured at a fixed location
- $f = 1/T$
- Units of Hertz (Hz) or s^{-1}

Velocity = distance/time = wavelength/period

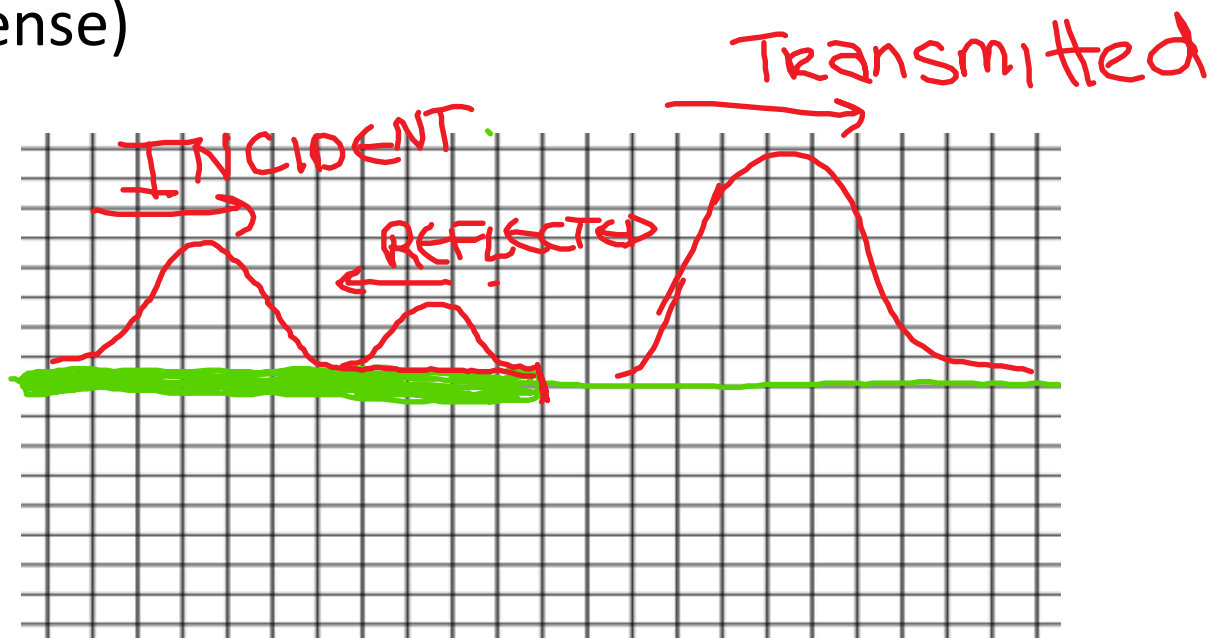
Wave Speed = Frequency*Wavelength

$$v = f * \lambda$$



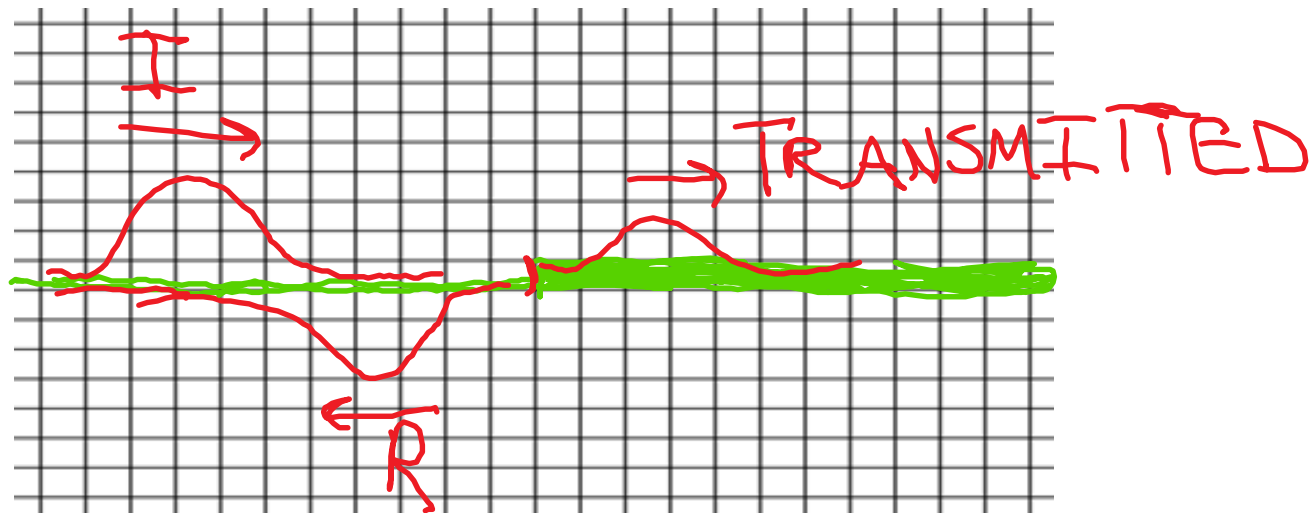
Waves Crossing Media Boundaries

Medium 1 (more dense) to Medium 2 (less dense)



Medium 2 (less dense) to Medium 1 (more

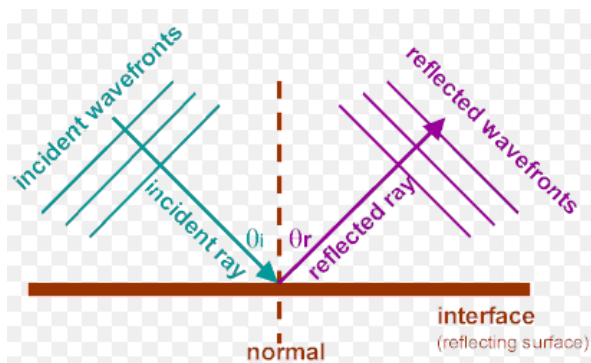
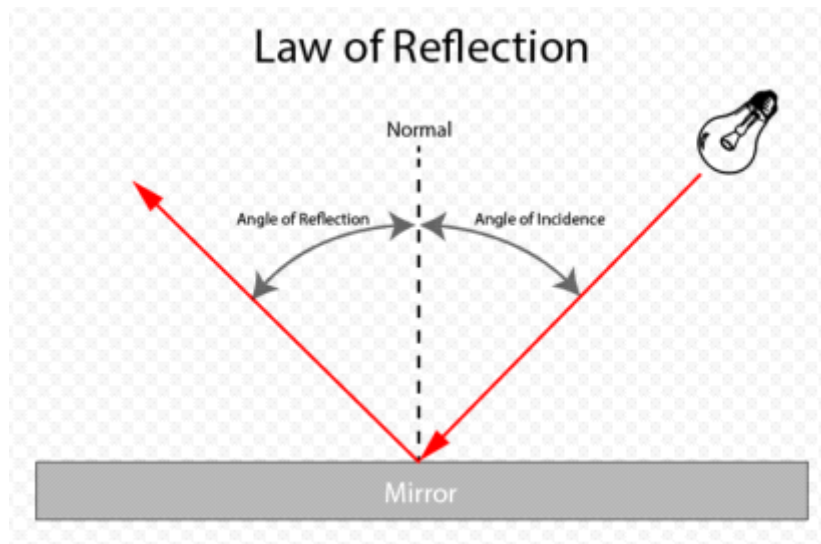
dense)



Conclusions:

- Wave speed is greatest in least dense medium
- Wavelength is greatest in least dense medium
- Frequency of a wave not altered when crossing a boundary
- Reflected pulse becomes inverted when a wave in a less dense medium is heading towards a boundary with a more dense medium

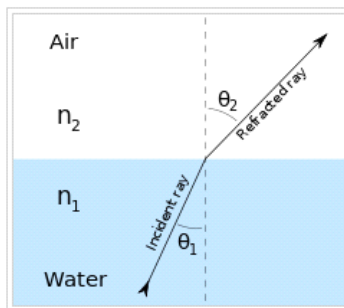
REFLECTION



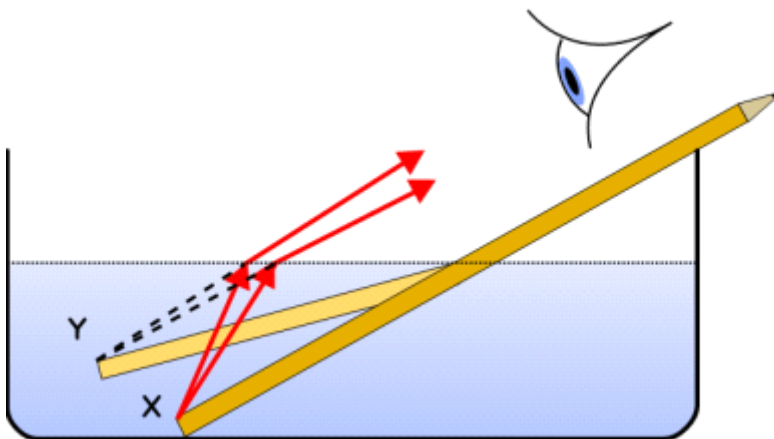
REFRACTION

Refraction - change in direction of waves at media boundary

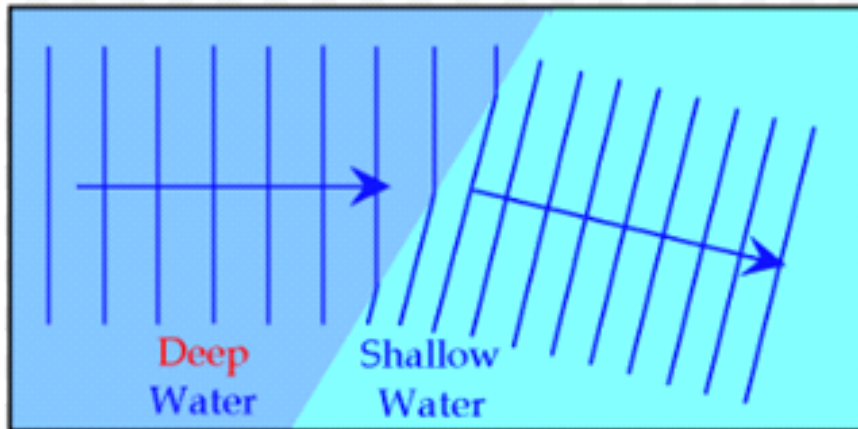
Snell's Law



$$\frac{\sin \theta_1}{\sin \theta_2} = \frac{v_1}{v_2} = \frac{n_2}{n_1}.$$



Water waves



DIFFRACTION

Diffraction - bending of waves around obstacles and openings

- Amount of diffraction increases with increasing wavelength
- e.g. water waves (bend around structures), radio waves (bend around buildings), sound waves (bend around walls)

